

**PATENT**

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Reissue Application of:

KENNETH O. McELRATH ET AL.

Serial No.: 10/719,693

Filed: November 21, 2003

For: CARBON NANOTUBE PARTICULATE  
ELECTRON EMITTERS

Confirmation No.: 1355

Group Art Unit: 2879

Examiner: Natalie K. Walford

Attorney Docket: 3006.002000/KDG

**CUSTOMER NO. 23720**

**APPEAL BRIEF**

Commissioner for Patents  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

Applicants submit this Appeal Brief pursuant to 37 C.F.R. § 41.37. If the fee payment submitted with this brief is missing or insufficient, please deduct the fee from Williams, Morgan & Amerson, P.C. Deposit Account No. 50-0786/3006.002000KG.

I. REAL PARTY IN INTEREST

The real party in interest is Carbon Nanotechnologies, Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences, or judicial proceedings known to appellant, appellant's legal representative, or the assignee which are related to, directly affect, or are directly affected by, or have a bearing on the Board's decision in the pending appeal.

III. STATUS OF THE CLAIMS

Claims 1-10 are rejected and are the subject of this appeal. Claims 11-23 are canceled.

IV. STATUS OF AMENDMENTS

No amendments have been filed in this application after the final rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The claims relate to electron emitters that comprise a carbon nanotube particulate on a surface. A brief explanation of carbon nanotubes is given in the application at page 2, line 14 through page 3, line 13. The carbon nanotube particulate in the claimed invention comprises entangled small-diameter carbon nanotubes arranged in a three-dimensional network. The small-diameter nanotubes have an outer diameter in a range of about 0.5 nm and about 3 nm, and the carbon nanotube particulate has a cross-sectional dimension in a range of about 0.1 micron and about 100 microns. (See page 7, lines 9-30, and page 4, line 23, through page 5, line 1.)

Examples of such carbon nanotube particulates are shown in Figures 1A and 1B. Certain uses of such electron emitters are described at page 31, line 26 through page 32, line 28.

## VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

A. Are claims 1-10 unpatentable under 35 U.S.C. § 103(a) in view of Smalley et al., US Pub. 2002/0085968 (“*Smalley*”) and Jin et al., U.S. Patent 6,250,984 (“*Jin*”)?

B. Are claims 1-2 and 5-6 unclear and indefinite due to the use of the term “cross-sectional dimension”?

## VII. ARGUMENT

### A. THE CLAIMS ARE NONOBVIOUS OVER THE PRIOR ART

The Examiner rejected Claims 1-10 under 35 U.S.C. § 103(a) as obvious over Smalley et al., US Pub. 2002/0085968 (“*Smalley*”) in view of Jin et al., U.S. Patent 6,250,984 (“*Jin*”). Claim 1 requires, *inter alia*, an electron emitter that comprises a “carbon nanotube particulate on a surface wherein the carbon nanotube particulate comprises entangled small-diameter carbon nanotubes arranged in a three-dimensional network . . . wherein the carbon nanotube particulate has a cross-sectional dimension in a range of about 0.1 micron and about 100 microns.”

*Jin* discloses a process for fabricating nanotube field emitter structures. As shown in Figures 2A-2F and described at column 5, line 40 through column 9, line 11, the process begins by mixing carbon nanotubes 10 (e.g., a “tangled spaghetti” configuration) and conductive powder 12 (e.g., metal or alloy powder). (Figure 2A, and column 5, lines 43-64.) Next, the composite of nanotubes and conductive powder is pressed into a green compact 14 and either sintered or melted to form an ingot. (Figure 2B, and column 7, lines 35-55.) Next, the ingot is

sectioned parallel to the intended emitter surface. (Figure 2C, and column 8, lines 1-8.) The sectioning creates a number of broken nanotube ends at the sectioned surface.

After shaping the ingot (Figure 2D, and column 8, lines 16-19), a layer of metal is etched from the ingot 17 surface, to provide a “multitude of protruding nanotubes.” (Figure 2E, and column 8, lines 28-31.) Although the nanotube ends that protrude from the ingot are not necessarily parallel to each other, “the average deviation of the long axis of the nanotubes from a line normal to the supporting surface at the point on the surface from which the nanotube protrudes, is less than  $45^{\circ}$  . . . .” (Column 8, lines 47-67.) The structure produced by this process can then be assembled into a field emitting device. (Figure 2F, and column 9, lines 3-11.)

Therefore, although the ingot prepared by *Jin* contains a spaghetti-like mass of nanotubes, they are buried under the surface of the ingot. All that protrudes from the surface of the ingot are individual nanotubes, as can be seen clearly in Figures 2E and 12. (See the nanotube emitters 112 in Figure 12, which are described at column 15, lines 38-42.) Thus, the nanotube structures that are *on* the surface in *Jin* (i.e., extending outward from the surface) are not particulates that each comprise a plurality of entangled nanotubes, but instead are individual nanotubes. The carbon nanotubes arranged in a three-dimensional network in *Jin* are beneath the surface of the ingot, not *on* the surface as required by claim 1. Furthermore, *Jin* makes no suggestion that there should be a particulate that comprises entangled carbon nanotubes on top of a surface. *Jin* actually teaches away from such a structure, since *Jin* emphasizes the importance of emission from individual broken nanotube tips, rather than from a tangled aggregate of nanotubes. (Column 4, lines 38-55.)

*Smalley* teaches a felt or a mat comprising a tangled collection of single-wall carbon nanotube ropes stuck together having sizes of  $10\text{ mm}^2$ ,  $100\text{ mm}^2$ ,  $1000\text{ mm}^2$  or greater. (See

*Smalley*, paragraph 89.) Mats and felts are two out of many different nanotube structures disclosed by *Smalley*, and there is no suggestion that these structures should or could be used as electron emitters. Furthermore, the dimensions that the Examiner references in paragraph 88 of *Smalley* relate to ropes of nanotubes, as opposed to the felt in paragraph 89 which comprises a collection of multiple ropes stuck together in a mat. (See *Smalley* at paragraph 89, lines 1-4.) Therefore, even if one could consider the felt of *Smalley* to be relevant to electron emitters, which *Smalley* plainly does not suggest, the dimensional range recited in claim 1 for the nanotube particulate would still not be satisfied by the felt of *Smalley*.

An obviousness rejection based on a combination of references requires a motivation or suggestion to combine the references, coupled with a reasonable expectation of success. The motivation or suggestion must be in the prior art, in the knowledge of one of ordinary skill in the relevant art, or in some cases in the nature of the problem to be solved. *In re Huston*, 308 F.3d 1267, 64 U.S.P.Q.2d 1801, 1810 (Fed. Cir. 2002); *Boehringer Ingelheim Vetmedica, Inc. v. Schering-Plough Corp.*, 320 F.3d 1339, 65 U.S.P.Q.2d 1961, 1971-1972 (Fed. Cir. 2003).

Furthermore, the references must suggest the desirability, and thus the obviousness of making the combination, without the benefit of hindsight reasoning. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art and not in applicant's disclosure. "One cannot use hindsight reconstruction to pick and choose among isolated disclosures in the prior art to deprecate the claimed invention." *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q.2d 1596, 1600 (Fed. Cir. 1988).

There is no motivation or suggestion to combine the nanotube emitter structure of *Jin*, in which a tangled mass of nanotubes are buried in a metal ingot and only individual nanotube tips protrude from the surface of the ingot, with the felt or mat of *Smalley*, which has nothing to do

with electron emitters. Furthermore, even if one did make this combination, there is still nothing to suggest that the tangled mass of carbon nanotubes should be on the surface of a substrate, rather than buried in that substrate.

Because a *prima facie* case of obviousness has not been established for claim 1, this claim cannot be held obvious under 35 U.S.C. § 103(a). Claims 2-10 depend directly or indirectly on claim 1 and are nonobvious for same reasons.

B. THE CLAIMS ARE DEFINITE AND MEET THE REQUIREMENTS OF 35 U.S.C § 112

The Examiner has objected to Claims 1-2 and 5-6 and contends that the term “cross-sectional dimension” is unclear. Although the office action does not explicitly state that these claims are rejected as being indefinite under 35 U.S.C. § 112, second paragraph, in case the objection might be construed to include such a rejection implicitly, applicant will explain herein why these claims meet all applicable requirements.

Section 112, second paragraph, requires that the claims, when read in light of the specification, reasonably apprise a person skilled in the art of the scope of the invention. *Utah Medical Products, Inc. v. Graphic Controls Corp.*, 350 F.3d 1376, 69 U.S.P.Q.2d 1136, 1139 (Fed. Cir. 2003). If a person of ordinary skill in the art would understand the claim, then § 112, second paragraph, is satisfied. *In re Oetiker*, 23 U.S.P.Q.2d 1661, 1662 (Fed. Cir. 1991).

The Examiner has stated that the meaning of “cross-sectional dimension” is unclear in the subject claims. Claim 1, for example, states that “the carbon nanotube particulate has a cross-sectional dimension in a range of about 0.1 micron and about 100 microns.” Examples of the carbon nanotube particulates are shown in Figures 1A and 1B. From the examples shown in these figures, one can see that the particulates can have a range of cross-sectional dimensions.

Applicant has used the term “cross-sectional dimension” in accordance with the usual and customary meaning of the words as defined in *The American Heritage Dictionary, Second College Edition*, Houghton Mifflin Company, Boston, 1982. In this dictionary, the word “cross-section” is defined as “[a] section formed from a plane cutting through an object, usually at right angles to an axis.” The word “dimension” is defined as “[a] measure of spatial extent, esp. width, height, or length.” (Copies of these dictionary definitions are included in the Evidence Appendix.) Therefore, applicant believes that the term “cross-sectional dimension” is clear and would be understood by a person skilled in the art. That is all that is required by § 112, second paragraph.

#### VIII. CLAIMS APPENDIX

The claims that are the subject of the present appeal (1-10) are listed in the attached Claims Appendix.

#### IX. EVIDENCE APPENDIX

Attached in the Evidence Appendix are copies of dictionary definitions of “cross section” and “dimension.” These documents were introduced into the record as attachments to the response to office action that was filed on October 11, 2006.

#### X. RELATING PROCEEDINGS APPENDIX

There is no Related Proceedings Appendix for this appeal.

XI. CONCLUSION

Applicants respectfully request that the rejections of claims 1-10 be reversed.

Respectfully submitted,

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December 21, 2006

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## CLAIMS APPENDIX

1. An electron emitter comprising a carbon nanotube particulate on a surface wherein the carbon nanotube particulate comprises entangled small-diameter carbon nanotubes arranged in a three-dimensional network wherein the small-diameter nanotubes have an outer diameter in a range of about 0.5 nm and about 3 nm, wherein the carbon nanotube particulate has a cross-sectional dimension in a range of about 0.1 micron and about 100 microns.
2. The electron emitter of claim 1 wherein the particulate has a cross-section dimension in the range of about 0.1 micron and about 3 microns.
3. The electron emitter of claim 1 wherein the carbon nanotubes are selected from the group consisting of single-walled carbon nanotubes, double-walled carbon nanotubes, triple-walled carbon nanotubes, quadruple-walled carbon nanotubes and combinations thereof.
4. The electron emitter of claim 1 wherein the carbon nanotube particulate comprises ropes of carbon nanotubes.
5. The electron emitter of claim 4 wherein the ropes have a cross-sectional dimension in a range of about 10 nm and about 50 nm.
6. The electron emitter of claim 4 wherein the ropes have a cross-sectional dimension less than 10 nm.

7. The electron emitter of claim 4 wherein the carbon nanotube particulates comprise small-diameter carbon nanotubes having more than about 10 small-diameter carbon nanotubes/ $\mu\text{m}^2$  surface area of the carbon nanotube particulates.
8. The electron emitter of claim 4 wherein the carbon nanotube particulate on the surface has been activated by etching.
9. The electron emitter of claim 4 wherein the electron emitter is a component in a cathode of a field emission device.
10. The electron emitter of claim 9 wherein the field emission device is selected from the group consisting of electron tubes, amplifiers, oscillators, mixers, microwave components, discharge initiators, laser tubes, spark gaps, controlled discharge tubes, directed energy devices, display tubes, flat-panel displays and combinations thereof.

## **EVIDENCE APPENDIX**

Definitions from *The American Heritage Dictionary, Second College Edition*, Houghton Mifflin Company, Boston, 1982. These documents were introduced into the record as attachments to the response to office action that was filed on October 11, 2006.

## **RELATED PROCEEDINGS APPENDIX**

None.

ask) —*intr.* To question a person closely. —**cross-exam-**  
-ination *n.* —**cross-examiner** *n.*  
**cross-eye** (krɒs'ti, krɒs'ti) *n.* A form of strabismus in which  
one or both eyes deviate toward the nose. —**cross-eyed**  
adj.

**cross-fertilization** (krɒs'fɜːtɪl-ɪz-ə'shun, krɒs'-) *n.* 1. Biol.  
Fertilization by the union of gametes from different ind.  
vids, often of different varieties or species. 2. Bot. Fertiliza-  
tion of the ovule of one plant or flower by pollen nuclei  
from another. —**cross-fertilize** *adj.*

**cross-fertilize** (krɒs'fɜːtɪl-ɪz, krɒs'-) *tr. & intr.* -ized, -iz-  
ing, -izes. To fertilize or be fertilized by means of cross-  
fertilization.

**cross-filer** (krɒs'fɪl, krɒs'-) *intr. & tr.* Allied, filling, -files.  
To register as a candidate in the primaries of more than one  
political party. —**cross-filer** *n.*

**crossfire** (krɒs'fɪr, krɒs'-) *n.* 1. Lines of fire from two or  
more positions crossing each other at a single point. *soldiers*  
caught in *crossfire*. 2. A situation in which a number of  
things originating from different sources come together.  
3. A rapid, often agitated discussion.

**cross-grained** (krɒs'grænd, krɒs'-) *adj.* 1. Having an irregu-  
lar, transverse, or diagonal grain. 2. Troublesome to deal  
with; contrary.

**cross-hair** *n.* Either of two fine strands of wire crossed in  
the focus of the eyepiece of an optical instrument and used  
as a calibration or sighting reference.

**cross-hatch** (krɒs'hætʃ, krɒs'-) *tr.* -hatched, -hatching,  
-hatches. To mark with two or more sets of intersecting  
parallel lines. —**cross-hatched** *n.*

**cross-head** (krɒs'hed, krɒs'-) *n.* A beam that connects the  
piston rod to the connecting rod of a reciprocating engine.

**cross-index** (krɒs'ɪndeks, krɒs'-) *v.* -dexed, -dexing, -dex-  
es —*tr.* To furnish (an index) with cross-references. —*intr.*  
To furnish cross-references. —**cross-index** *n.*

**crossing** (krɒs'ɪŋ, krɒs'ɪŋ) *n.* 1. A place at which roads,  
flats, or tracks intersect; intersection. 2. The place at which  
something, such as a river or highway, may be crossed.  
3. The intersection of the nave and transept in a cruciform  
church.

**crossing over** *n.* The exchange of genetic material between  
homologous chromosomes.

**cross-matching** *n.* The process in which blood compatibil-  
ities are tested between a donor and a recipient before  
transfusion.

**cross-multiply** (krɒs'mʌlti'plɪ, krɒs'-) *intr.* -plied, -ply-  
ing, -plies. To multiply the numerator of one of a pair of  
fractions by the denominator of the other. —**cross multipli-**  
-cation *n.*

**cross-over** (krɒs'ɒvə, krɒs'-) *n.* 1. A place at which or the  
means by which a crossing is made. 2. A short connecting  
track by which a train can be transferred from one line to  
another. 3. Genetics. a. A crossing over. b. A character re-  
sulting from crossing over. 4. A registered member of one  
political party who votes in the primary of the other party.  
—*metaphor*: the *cross-over vote* in California

**cross-patch** (krɒs'pætʃ, krɒs'-) *n.* Informal. A peevish, iras-  
cible person. [CROSS + OBS. *patch*, *pester*.]

**cross-piece** (krɒs'piːs, krɒs'-) *n.* A transverse piece, as of a  
structure.

**cross-pollinate** (krɒs'pɒlɪ'neɪt, krɒs'-) *tr. & intr.* -nated, -nat-  
ing, -nates. Bot. To cross-fertilize (a plant or flower).  
—**cross-pollination** *n.*

**cross-product** *n.* Vector product.

**cross-purpose** (krɒs'pɜːps, krɒs'-) *n.* A conflicting or  
contrary purpose. —*idiom*: be at *cross-purposes*. To have  
and act under a misunderstanding of each other's purposes.

**cross-question** (krɒs'kwɛ'sʃən, krɒs'-) *tr. & intr.* -tioned, -tion-  
ing, -tions. To question closely; cross-examine. —*n.* A ques-  
tion asked in the process of cross-examination.

**cross-reaction** (krɒs'rɪ'ækʃən, krɒs'-) *n.* The reaction  
between an antigen and an antibody that was generated  
against a different antigen. —**cross-react** *v.* (-acted, -act-  
ing, -acts). —**cross-reactive** *adj.* —**cross-reactivity** *n.*

**cross-refer** (krɒs'rɪ'fɜː, krɒs'-) *v.* -ferred, -fering, -fers.  
-fers. To refer from one part or passage to another. —*intr.*  
To make a cross-reference.

**cross-reference** (krɒs'rɪ'fə:ns, -rɪ'fə:ns, krɒs'-) *n.* A refer-  
ence from one part of a book, index, catalogue, or file to  
another part containing related information.

**cross-road** (krɒs'rɒd, krɒs'-) *n.* 1. A road that intersects  
another road. 2. *crossroads*. (used with a sing. verb). a. A  
place where two or more roads meet. b. A place where dif-  
ferent cultures meet. c. A crucial point or place.

**cross-ruff** (krɒs'rʌf, -rʌf, krɒs'-) *n.* A series of plays in  
pools of the whist family where partnership hands alterna-  
tely ruff suits led by the other partner. —*v.* -ruffed, -ruff-  
ing, -ruffs. —*intr.* To perform a crossruff or a series of cross-  
ruffs. —*tr.* To ruff (one's partner's lead or a lead from the  
dummy) alternating plays.

**cross-section** *n.* 1. a. A section formed by a plane cutting  
through an object, usually at right angles to an axis. b. A  
piece so cut or a graphic representation of such a piece.  
2. *figure*. A measure of the probability of occurrence of a  
particular atomic or nuclear reaction. 3. A representative

sample meant to be typical of the whole. —**cross-section-**  
-al *adj.*

**cross-stitch** (krɒs'stɪtʃ, krɒs'-) *n.* 1. In sewing and embroi-  
dery, a double stitch forming an X. 2. Needlework made  
with cross-stitches. —*v.* -stitched, -stitching, -stitches.  
—*tr.* To make or embroider with cross-stitches. —*intr.* To  
work in cross-stitch.

**cross-talk** (krɒs'tɔːk, krɒs'-) *n.* Noise or garbled sounds  
heard on a telephone or other electronic receiver, caused by  
interference from another channel.

**cross-tie** (krɒs'ti, krɒs'-) *n.* A transverse beam or rod serv-  
ing as a support, esp. a beam that connects and supports the  
rails of a railroad.

**cross-town** (krɒs'taʊn, krɒs'-) *adj.* Running or extending  
across a city or town: a *cross-town bus*. —*adv.* Across a city  
or town.

**cross-tree** (krɒs'tri, krɒs'-) *n.* *Noun*. One of the two hori-  
zontal crosspieces at the upper ends of the lower masts in  
fore-and-aft-rigged vessels, serving to spread the shrouds.

**cross-vault** *n.* A vaulting formed by the intersection of two  
or more simple vaults.

**cross-walk** (krɒs'wɔːk, krɒs'-) *n.* A path marked off for pe-  
destrians crossing a street.

**cross-way** (krɒs'weɪ, krɒs'-) *n.* A crossroad.

**cross-ways** (krɒs'weɪz, krɒs'-) *adv.* Variant of *crosswise*.

**cross-wind** (krɒs'wɪnd, krɒs'-) *n.* A wind blowing at right  
angles to a given direction, as to an aircraft's line of flight.

**cross-wise** (krɒs'waɪz, krɒs'-) *also* *crossways* (-waɪz) *adv.*  
Across.

**cross-word puzzle** (krɒs'wɜːd, krɒs'-) *n.* A puzzle in which  
an arrangement of numbered squares is to be filled with  
words running both across and down in answer to corre-  
spondingly numbered clues.

**crotch** (krɒtʃ, krɒtʃ) *n.* 1. The angle or region of the angle formed  
by the junction of two parts or members, such as two  
branches, limbs, or legs. 2. The fork of a pole or other sup-  
port. [Poss. alteration of *crook*.] —**croched** (krɒtʃt) *adj.*

**crochet** (krɒtʃet, krɒtʃet) *n.* 1. A small hook or hooklike structure.  
2. An odd, whimsical, or stubborn notion. 3. *Mus.* A quar-  
ter note. [ME *crochet* < OFr. —see *CROCHET*.]

**crochety** (krɒtʃi'ti, krɒtʃi'-) *adj.* Capriciously stubborn or eccen-  
trical; perverse. —**crochety-ness** *n.*

**croton** (krɒtɒn, krɒtɒn) *n.* 1. Any of various chiefly tropical plants,  
shrubs, or trees of the genus *Croton*. 2. Any of various tropi-  
cal plants of the genus *Codiaeum*, esp. *C. variegatum pictum*,  
frequently grown as a house plant for its showy, varicolored  
foliage. [NLat. *Croton*, genus name < Gk. *krōton*, castor oil  
plant.]

**Croton bug** *n.* A small light-brown cockroach, *Blattella ger-*  
manica, that is a common household pest. [After the *Croton*  
River, New York.]

**crotonic acid** (krɒtɒn'ɪk, krɒtɒn'-) *n.* An organic acid, C<sub>10</sub>H<sub>16</sub>O<sub>6</sub>,  
used in the preparation of pharmaceuticals and resins. [*<*  
NLat. *Croton*, plant genus, —see *CROTON*.]

**croton oil** *n.* A yellowish-brown, violently emulsive oil ob-  
tained from the seeds of a tree, *Croton tiglium*, of southeast-  
ern Asia.

**crouch** (krəʊtʃ, krəʊtʃ) *v.* -crouched, -crouching, -crouches. —*intr.*  
1. To stoop with the limbs pulled close to the body. 2. To  
bend servilely or timidly; cinge. —*tr.* To cause to bend low,  
as in fear or humility. —*n.* The act or posture of crouching.  
[ME *crouchen* < OFr. *crochier*, to be bent < *cruc*, hook.]

—**crouchingly** *adv.*

**croup (krəʊp, krəʊp) *n.* A pathological condition affecting the lar-  
ynx in children, characterized by respiratory difficulty and a  
harsh cough. [Orig. unknown.] —**croupous** (krəʊ'pəs, krəʊ-  
pə's) *adj.***

**croup** also **croupe** (krəʊp, krəʊp) *n.* The hump of certain animals,  
esp. a horse. [ME *croupe* < OFr., of Germanic orig.]

**croupier** (krəʊ'piə, -piə) *n.* An attendant at a gaming  
table who collects and pays bets. [Fr. < *croupe*, rump, croup  
< OFr.]

**crouton** (krəʊ'tɒn, krəʊ'tɒn) *n.* A small crisp piece of  
toasted or fried bread. [Fr. *crouton* < *croûte*, crust < OFr.  
*cruste* < Lat. *crusta*.]

**crow** (krəʊ, krəʊ) *n.* 1. Any of several large, glossy, black birds of  
the genus *Corvus*, having a characteristic raucous call, esp.  
*C. brachyrhynchos*, of North America. 2. A crowbar. —*idi-*  
-om, as the *crow flies*. In a straight line. *eat crow*. Informal.  
To be forced into a humiliating situation, as from having  
been in error. [ME *crowe* < OE *crāwe*.]

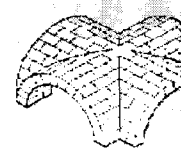
**crowd** (krəʊ, krəʊ) *intr.* -crowed, -crowing, -crows. 1. *Past tense and*  
*past participle* *crowed* or *crow* (krəʊ). To utter the shrill cry  
characteristic of a cock or rooster. 2. a. To exult blatantly,  
esp. over the misfortune of another. b. To brag or boast  
exultantly. 3. To make a sound expressive of pleasure or  
well-being, characteristic of an infant. —*n.* 1. The shrill cry  
of a cock. 2. An articulate sound expressive of pleasure or  
delight. [ME *crowen* < OE *crāwan*.]

**Crow** (krəʊ, krəʊ) *n.* 1. a. A tribe of Indians  
formerly inhabiting the region between the Platte and Yel-  
lowstone rivers and now settled in southeastern Montana.  
b. A member of this tribe. 2. The Sicuan language of the  
Crow.

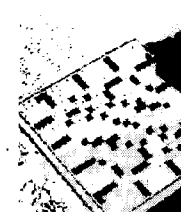
**crow-bar** (krəʊ'bɑː, krəʊ'bɑː) *n.* A straight bar of iron or steel,  
with the working end shaped like a forked chisel, used as a lever.



cross-tree



cross-vault



crossword puzzle



crow



crowbar

ppp/cross/sauce/sh ship/dish/t tight/th thin/path/th this/bathe/ū cut/ūr urge/v valve/w with/y yes/z zebra/size/  
l/riou/s/about/item, edible/gallop/circus/α Fr. feu, Ger. schön/δ Fr. tu, Ger. über/κπ Ger. ich, Sent. loch/π Fr. bon.

2. Materials  
lights. Arch.  
arrange < Lat.

di- of a flag  
neb. 3. a. Any  
ough 9. b. Sub  
4E < Lat. dig

mbing a digi  
in digits, es  
uding in digi  
ano. —digi-  
at-

rms operation  
digits, usually

white powder  
disease [pro-

genus *Digitalis*  
pared from the  
cardiac stimu  
digitalis, digi  
n < *digitus*, fi

izes. To use  
physiological

adj. 1. Having  
isting fingerli

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di- hastily with a defeated party [G. < Lat. *diceretur*,  
pass. part. of *dicare*, to dictate.]

**Dilantin** (dī-lā'nīn). A trademark for diphenylhydantoin  
salt, an anticonvulsant drug used to treat epilepsy.

**dilapidate** (dī-lāp'ī-dāt) *v.* & *intr. v.* -dated, -dating.  
To bring or fall into a state of ruin, decay, or disre-

pair [Lat. *dilapidare*, *dilapidare*, to throw away, destroy;  
by part. -*lapidare*, to throw stones < *lapis*, stone.] —*di-*  
lapidation *n.*

**dilapidated** (dī-lāp'ī-dāt) *adj.* Fallen into a state of dis-  
repair; broken-down.

**dilatancy** (dī-lā'tā-nē, dī-) *n.* 1. The increase in volume of  
certain materials, as of wet sand, sub-

jected to a deformation that alters the interparticle dis-  
tances of its constituents from their minimum-value  
configuration. 2. Any of various phenomena, such as in-

crease in viscosity or solidification, that result from dila-

tionary deformation.

**dilate** (dī-lāt, dī-) *v.* 1. Tending to dilate; dilating.  
2. Showing dilatancy. —*n.* A dilator.

**dilation** (dī-lā'shən, dī-lā-) *n.* 1. The act or process of  
dilating. 2. The condition of being dilated or stretched.

**dilute** (dī-lūt, dī-) *v.* 1. To make thin or less dense;  
2. To make less intense or less strong. —*n.* A dilution.

**dilution** (dī-lū'shən, dī-) *n.* 1. The process of diluting.  
2. A dilute or weakened condition. 3. A diluted substance.

**diluvial** (dī-lū'vē-əl) *adj.* Also **diluvian** (-i-ən) *adj.* Of or pro-  
duced by a flood. [LLat. *diluvialis* < Lat. *diluvium*, flood <  
*diluvare*, to dilute.]

**dim** (dīm) *adj.* **dimmer**, **dimmer**, **dimmer**. 1. a. Deficient in bright-  
ness. b. Shedding a small amount of light; faint. c. Negative  
or unpromising. *look a dim view of our prospects*. 2. Lacking  
brightness or luster; subdued; dull. 3. Indistinct; obscure.

**dimly** (dīm-lē) *adv.* 1. To make dim. 2. To put on low beam: *dim the  
headlights of an automobile*. —*intr.* To become dim. —*pl.*  
**dimms**. The parking lights on an automobile. [ME < OE  
*dim*.] —**dimly** *adv.* —**dimness** *n.*

**dime** (dīm) *n.* A U.S. coin worth ten cents. [ME, tenth part <  
Ofr. < Lat. *decima* (part), tenth (part) < *decem*, ten.]

**dimenhydrinate** (dīmēn-hī'drā-nāt) *n.* An antihista-  
mine. C12H17ClN2O2, used to treat motion sickness and al-  
lergic disorders. [DIME (THYL) + (AMIN) (E) + HYDR (O) +  
-IN + -ATE.]

**dime novel** *n.* A cheap romance or adventure novel. —**dime  
novelists** *n.*

**dimension** (dīmēn'shən, dīm-) *n.* 1. A measure of spatial  
extent, esp. width, height, or length. 2. Often dimensions.  
Extent; magnitude; size; scope. 3. *Math.* a. Any of the least  
number of independent coordinates required to specify a  
point in space uniquely. b. The range of any of these coordi-

ates. 4. *Physics* A physical property, often mass, length,  
time, or a combination thereof, regarded as a fundamental  
measure or as one of a set of fundamental measures of a  
physical quantity: *Velocity has the dimensions of length di-*

*vided by time*. —*tr. v.* -sioning, -sions. To cut or  
shape to specified dimensions. [ME *dimension* < Ofr. *di-*  
*mension* < Lat. *dimensio*, extent < *dimensus*, p. part. of *di-*  
*metri*, to measure: *di-* (intensive) — *metri*, to measure.]

**dimensional** (dīmēn'shən-əl) *adj.* —**dimensionality** (-shə-nāl'ī-tē) *n.*  
—**dimensionally** *adv.* —**dimensionless** *adj.*

**dimmer** (dīm-ər) *n.* 1. A molecule consisting of two identical  
simple molecules. 2. A chemical compound consisting of  
dimers.

**dimetric** (dīm-ē-trīk) *adj.* Biol. Composed of two parts or  
divisions.

**diminutive** (dīm'ī-nū-tiv) *adj.* 1. Consisting of two parts or  
segments, as the tarsus in certain insects. 2. Bot. Having  
flower parts, such as petals, sepals, and stamens, in sets of  
two. —**diminutives** *n.*

**dime store** *n.* Five-and-ten.

**dimeter** (dīm'ī-tər) *n.* A verse consisting of two metrical  
feet or of two dipodies. [LLat. < Gk. *dimētrōs*, having two  
meters: *di-*, two + *metron*, meter.]

**dimethyl** (dīm-ē-thēl) *n.* Ethane.

**dimethylsulfoxide** (dīm-ē-thēl-sūl-fōk'sīd) *n.* A color-  
less hygroscopic liquid, (CH3)2SO, obtained from lignin,  
used as a solvent and in medicine as a skin penetrant to  
convey medications into the tissues.

**diminish** (dīm'ī-nīsh) *v.* -ished, -ishing, -ishes. —*tr.*  
1. a. To make smaller or less or cause to appear smaller or  
less. b. To detract from the authority, rank, or prestige of.  
2. To cause to taper. 3. *Math.* To reduce (a perfect or minor  
interval) by a semitone. —*intr.* 1. To become smaller or less.  
2. To taper. [ME *diminishen*, blend of *diminuen*, to lessen (<  
Ofr. *diminuer* < Lat. *diminuere*: *de-*, from + *minuere*, to  
lessen) and *minuiscen*, to reduce (< Ofr. *minuiscen* < VLat.  
*\*minuiscere* < Lat. *minucia*, smallness < *minutus*, small,  
p. part. of *minuere*, to lessen).] —**diminishable** *adj.* —**di-**  
**minishment** *n.*

**diminishing returns** *pl. n.* The rate at which profits dimin-  
ish in proportion to the amount of further investment after  
a certain point.

**diminution** (dīm'ī-nū'shən, -nyō-) *n.* *adj.* & *adv.* Mus. De-  
creasing. [Ital. *diminuzione* < Lat. *diminuendū*, gerund  
of *diminuere*, to diminish.]

**diminution** (dīm'ī-nū'shən, -nyō-) *n.* 1. a. The act or  
process of diminishing. b. The resulting reduction; de-  
crease. 2. Mus. The repetition of a theme in notes one-  
quarter or one-half the duration of the original. [ME *dimin-*  
*ution* < Ofr. *diminution* < Lat. *diminutio* < *diminuere*, to  
diminish.] —**diminutional** *adj.*

**diminutive** (dīm'ī-nū-tiv) *adj.* 1. Of very small size; tiny.  
2. Designating certain suffixes that denote smallness, youth,  
familiarity, or affection, as *-let* in *booklet* or *-kin* in *lantern*.

**diminutives** *n.* A diminutive suffix, word, or name. [ME *diminutiv* <  
Ofr. < Lat. *diminutivus* < *diminuere*, p. part. of *diminuere*,  
to diminish.] —**diminutively** *adv.* —**diminutiveness** *n.*

**dimity** (dīm'ī-tē) *n.* *pl.* -ties. A sheer, crisp cotton fabric,  
usually corded or checked. [ME *dimy* < Med. Lat. *dimyrum*  
< Med. Gk. *dimyros*, double-threaded < Gk. *di-*, two +  
*myros*, thread.]



**dilapidate**  
A dilapidated building

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